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EFFECT OF CADMIUM NITRATE ON ACUTE TOXICITY OF FISH CHANNA PUNCTATUS AT 72 HR. BY STATISTICAL METHOD.

Zoology

S.B. Jadhav Department of Zoology and Fishery Science, Dayanand Science College, Latur.
Dr. S. V. Phadke* Department of Zoology, Shivaji College, Renapur *Corresponding Author

ABSTRACT

This study was carried out on fish Channa Punctatus to investigate the lethal concentration of cadmium nitrate on fish Channa punctatus at 72 hr. Experiment procedure was repeated five times at the selected cadmium nitrate concentration noting the number of fish killed. The mean value was taken. These values were taken to determine LC50 value for 72 hr. The results are clearly shows that the LC50 value decreased with increase in exposure period.

KEYWORDS

Pollution, Cadmium Nitrate, Acute Toxicity, Channa Punctatus.

INTRODUCTION

Toxicity of heavy metal is assessed by most investigators by determining the concentration which kill 50% of the species for different periods of exposure. The exposure time period for the acute toxicity tests is generally 24, 48, 72 and 96 hours. For aquatic animals, LC_{50} values of toxicant are determined by exposing the animals in a static medium to different concentration of a toxicant for a fixed period of time.

And nothing down the concentration where 50% mortality is observed LC_{50} are determined by two different methods such as statistical method by probit analysis (Fineey, 1971) and Dragstedt and Bechren's (1975) method using cumulative mortality.

In the present investigation LC_{50} values for different interval of time for heavy metal cadmium nitrate for fish Channa Punctatus was determined. The importance of experimental exposure of fish to industrial waste was predicting its potential damage to aquatic ecology has been advocated and demonstrated reported by Sprague, (1969). Information provided by various toxicity tests can be used in the management of water pollution.

a> To estimate the environmental effects of a waste.
b> To compare different toxicants among tested animals.
c> To regulate the amount of discharge of pollutants (Buikema et. al. 1982).

MATERIAL AND METHOD

Test fishesChanna Punctatus were collected from yeldari river Parbhani district. After collection the fishes were acclimatized in laboratory condition at room temperature for 2-3 days. The active acclimatized fishes of approximately same size were selected for experiment.

For determination of acute toxicity the laboratory acclimatized fishes were sorted into 8 batches of 10 each. Since an increase in fish density (Number) is known to increase toxicity (Holden, 1973) a constant ratio of fish biomass to water volume was maintained clean, aged dechlorinated water was used for experiments.

One day prior to the commencement of experiment, feeding was stopped water level in all aquaria was maintained same. The test fish were also not fed during bioassay test.

As susceptibility of the fish to heavy metals is known to vary with size (Height and Fingerman, 1977).

Stock solution of cadmium nitrate were prepared for bioassay tests, Few concentrations from stock solution were prepared as per dilution technique suggested by APHA (1998). The water used for maintaining the animal during acclimatization.

Pilot reading is taken for cadmium nitrate, suitable dilution of toxicant were prepaired.

1.Statistical Method :-

The method makes use of probit analysis. The percent mortalities obtained were converted to probit kills by using regression equation according to finney (1971)
The regression equation
$Y = a + bx$

RESULT :-

In these experiments, the test concentration of cadmium nitrate ranged from 0.4 to 1.0 ppm. The mortality rates were 10,20,40,50,70,90 and 100% in test concentration of 0.4, 05, 06, 0.7, 0.8, 0.9 and 1.0 ppm respectively.

In bioassay test LC_{50} of cadmium nitrate were analyzed average valued for 72 hrs. were 0.5759 ppm.

Table No : 1 Physico – Chemical parameters of water used for Acute toxicity test.

Sr. No	Physico-Chemical Parameters	Range
1.	PH	7.2+7.4
2.	Temperature (C0)	24+4
3.	Do (mg/1)	8.0+3.0
4.	Hardness of CaCo3 (mg/l)	150+20
5.	Chlorides (mg/l)	172.5+0.8
6.	Salinity (g/l)	311.3+0.7

Table No. 2 Calculation of regression equation for LC_{50} of cadmium nitrate to the freshwater fish channa punctatus for 72 hours. (Probit analysis by finney, D.J, 1971)

Sr. No	Conc. In Ppm	Log conc.(X)	No.of Animal Exposed (N)	No.of mortality	% mortality P = 100 r/n.	Empirical probit	Expected probit (y)	Weighing Coefficient (W)	Weight W×w	Working probit (Y)	WX	WY	WX_2	WY_2	WXY.
1	0.4	0.6021	10	1	10	3.7184	3.7	0.33589	3.3589	3.719	2.0223	12.4917	1.2176	46.4566	7.5212
2	0.5	0.699	10	2	20	4.1584	4.1	0.47144	4.7144	4.159	3.2953	19.6071	2.3034	81.5459	13.7054
3	0.6	0.7782	10	4	40	4.7467	4.7	0.61609	6.1609	4.747	4.7944	29.2457	3.7304	138.8297	22.7590
4	0.7	0.8451	10	5	50	5.0000	5	0.63662	6.3662	5.000	5.3800	31.831	4.5461	159.1550	26.9003
5	0.8	0.9031	10	7	70	5.5244	5.5	0.59099	5.9099	5.523	3.2469	32.0880	4.7379	177.2222	28.9787
6	0.9	0.9542	10	9	90	6.2816	6.2	0.37031	3.7031	6.281	3.5334	23.2591	3.3713	146.0906	22.1939
Total									30.2134		22.2723	148.523	19.9067	749.3	122.0585

$X = Swx = \frac{22.2723}{Sw30.2134} = 0.7371$

$Y = Swy = \frac{148.523}{Sw30.2134} = 4.9157$

$b = \frac{Swxy - (X \times swy)}{Swx^2 - (X \times Swx}$

$b = \frac{122.0585 - (0.7371}{19.9067 - (0.7371}$

$b = \frac{122.0585 - 109.4763}{19.9067 - 16.4169}$

$b = \frac{12.5822}{3.4898}$

$b = 3.6054$

Regression Equation:-

$Y = Y - b\ (X - X)$
$Y = 4.9157 + 3.6054\ (X - 0.7371)$

Y = 4.9157 + 3.6054 X - 2.6575
Y = (3.6054) X + -2.2584
Y = 5, X =?
5 = (3.6054) X + 2.2582
5 –2.2582 = 3.6054
X = 2.7418
3.6054
Anti log of X = 0.7604
LC50 For 72 hours = 0.5759PPm.

DISCUSSION:-

The LC_{50} values found for different fish species are the cadmium chloride to clariusbatrachus 8.21 µg/l (Selvanthan, et. Al. 2011); to clariusbatrachus 103 µg/l (Bilal, et. al 2011); to Channa (OphiocephalusStriatus) 0.63 mg L^{-1} (Bais and Lokhande); to TilapiaMossambica 209.34 mg/lit. (Suresh at al; 1993)

Cadmium sulphate to ctenopharyngodonidella 9.42 mg/l (Emure and Ali; 2003). Analyses Showed Significantly P<0.0le groups, Labeorohita exhibited significantly. The exact causes of death due to heavy metal poisoning are multiple and depend mainly on time concentration and combination.

Mortality was one of the important factors, observed over 96 hours for all three composition of cadmium for three seasons. The fish mortality may have resulted by absorption, bio-accumulation of cadmium compounds or greater affect of chemical in body of fish Spehar (1976) reported that the 96 hr. LC_{50} of cd for flag fish, Jordaneliafloridae, was 2.5 mg/l. Hameed (1992) found that the 72 hr. LC_{50} of cd for MugilSeheli was 0.87 mg/l.

Tilak, et. al (2007) working on toxicity of cadmium and copper on the freshwater fish MugilSeheli and recorded that the acute toxicity tests of cadmium and copper at 96 hrs. LC_{50} values of cd and cu were 5.36 and 1.64 Ppm.

CONCLUSION :-

The test fish was selected for the toxic study because of its high commercial value easy availability and adaptability to laboratory condition.

Due to air breathing habit this fish is excellent for the laboratory maintenance.

The LC_{50} values decreased with increased in exposure period and with increase duration of exposure the heavy metals become toxic even at lower concentrations.

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